

HERPETOLOGY.—*Hyla cinerea* in Maryland, Delaware, and Virginia, with notes on the taxonomic status of *Hyla cinerea evittata*.<sup>1</sup> CLYDE F. REED, Baltimore, Md. (Communicated by Doris M. Cochran.)

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The latest checklist of North American amphibians and reptiles, by Karl P. Schmidt (pp. 69–70, 1953), is quite inaccurate in its distribution of *Hyla cinerea* (Schneider). It states that *Hyla cinerea cinerea* ranges in the "lowlands of the Atlantic and Gulf States from Virginia to Texas; north in the Mississippi Basin to southern Illinois." The range for *Hyla cinerea evittata* Miller is given as "The Delmarva Peninsula, eastern Maryland and adjacent Virginia." From these two statements one would conclude that *evittata* was a distinct northern subspecies with geographic limitations. Schmidt has indicated such to be the case by calling *evittata* the northern green tree frog.

The purpose of this paper is to show that the taxon *evittata* should be reduced to the synonymy of *Hyla cinerea* (Schneider), since none of the characters upon which *evittata* was originally based hold up as distinguishing it as a biological entity from other populations of *Hyla cinerea*.

The problem developed from the instigation of the new taxon *Hyla evittata* by G. S. Miller, who separated *evittata* from *cinerea* on the basis of the absence of the lateral bright stripe in the former, as the name *evittata* implies, together with the characters a broader head and a higher snout.

*Hyla evittata* Miller, Proc. Biol. Soc. Washington **13**: 76. Sept. 28, 1899. Type adult male (in alcohol) U. S. Nat. Mus., Washington no. 26, 291, collected at "Four Mile Run, Alexandria County, Virginia," July 15, 1898, by Gerrit S. Miller, Jr., and Edward A. Preble.

There are several matters concerning the type that are misleading. First, the type label reads "Four Mile Run, D. C." The type specimen is accessioned as "Four Mile Run, Virginia." Four Mile Run is near the city of Alexandria, but I have been unable to find an Alexandria County, even in 1899. There was an Arlington County, in which Alexandria was a city. At the

<sup>1</sup>Contribution to the Herpetology of Maryland and Delmarva, no. 4.

present Alexandria is an independent city (no county).

Second, the date on the type specimen is July 15, 1899, not July 15, 1898, as quoted in Miller's original publication, and by Wright and Wright (*Handbook of frogs and toads*, p. 310), which is a quotation of the original description. The type specimen is also accessioned as being collected July 15, 1899.

Third, the pagination for the description of the type of *Hyla evittata* is page 76, not page 75 as cited in Schmidt's checklist (p. 70), who gives the location of Four Mile Run as Fairfax County, Va. There is nothing to indicate the name of the new species on page 75. Besides, the description is really on page 76.

Fourth, the date of publication is September 28, 1899, not August 1899, as indicated on the type label.

Fifth, concerning the paratypes, at least those specimens designated as paratypes: There are four specimens in the U.S. National Museum which are designated as paratypes, collected at Four Mile Run, Va., July 15, 1898. U.S.N.M. nos. 66207, 66209, and 66210 have no stripes, while no. 66208 has a long stripe. These four specimens are referred to only by inference in the original article by Miller, and the museum numbers are not cited. However, Miller probably did have these specimens before him while describing the new species, and in the broadest sense of the term could be considered paratypes. However, from the measurements given below he did not include theirs with that of the type. When their measurements are included, the range is well within that of typical *Hyla cinerea*.

Three other specimens are also designated as paratypes, collected at Four Mile Run, Va., July 4, 1901. Since these could not have been seen at the time the new species was described (1899), they are topotypes and not paratypes, U.S.N.M. nos. 29652–29654. Two of these have no stripes, while the third has a white upper lip back to the axial of the jaw.

Sixth, Miller states concerning the general characteristics, "Like *Hyla cinerea* (Daudin), but with broader, deeper muzzle and normally un-

striped body and legs." *Hyla cinerea* was originally described by Schneider, Hist. Amph. 1: 174. 1799, as *Calamita cinereus*. Daudin described *Hyla lateralis*, in Sonnini and Latreille, Hist. Nat. Rep. 2: 180. 1802, from Charleston, S. C. This is considered a synonym of *Hyla cinerea* (Schneider).

Because of the confusion and uncertainty which accrues when these criteria are used in identifying specimens from Maryland, Delaware, and the main estuaries of the Chesapeake Bay, as the Potomac, Patuxent, Gunpowder (including Bird River and Dundee Creek), Elk, Sassafras, Choptank, Nanticoke, Pocomoke, York, and James Rivers, reviews of these criteria were made by Noble and Hassler (Copeia 1936(1): 63) for southern Maryland species and by Dunn (Proc. Biol. Soc. Washington 50: 9-10. 1937) upon the stratus of *H. evittata*, based on 126 specimens from Virginia and Maryland.

In describing *Hyla evittata*, Miller (1899) had noted that the lateral strips may be reduced in length in some specimens of *Hyla cinerea*. This phenomenon was considered a rare variation by him. However, the short stripe occurs in nearly all the populations in our region, a situation which has led to the belief that we are dealing with intermediates or hybrids. These concepts will be discussed later. There is a tendency for the more northern populations of *H. cinerea* to have some individuals with shorter or even no stripes. According to Miller it was head shape and not the body stripe which distinguished *evittata* from the typical form.

Noble and Hassler (Copeia 1936(1): 63) studied a population of *Hyla cinerea* (32 specimens from Cove Point, Calvert County, Md.) in which some lacked the light stripes along the sides of the body; some had only a tinge of white on the posterior part of the upper jaw; some had stripes which extended beyond the tympanum and faded out on the sides of the body. Specimens from Wilmington, North Carolina, reported by Myers (Copeia 1924, no. 131: 60) and restudied in the American Museum by Noble and Hassler showed a similar situation (14 adults studied—2 without stripes, 4 with partial stripes, 8 with full stripes).

Seven statements in the original description of *Hyla evittata* lead one to think that Miller was not too sure that his was a new species. For example, "*Hyla evittata* is at once distinguishable from *H. cinerea* by the absence of

the stripes on sides and legs, so conspicuous in the latter". Yet he cites specimens from Mississippi and Louisiana that have no stripes. "Except for the difference in the shape of the head, the two animals (the type and *H. cinerea* from Bay St. Louis, Mississippi) agree perfectly in form and dimensions." Dunn has discounted the value of the head measurements in separating two populations as subspecies. "*Hyla evittata* probably averages slightly larger than *H. cinerea*." All that are mentioned in the paper are the measurements of the type and the *H. cinerea* specimen from Mississippi. Head and body lengths are the same—48 mm; hind leg—69 and 68; femur same—20; tibia same—21; tarsus same—11; hind foot—17 and 15; humerus—8 and 9; forearm—8 and 9; front foot same—10; greatest width of head—14 and 13. Concerning the eye to nostril measurements the type is 3.5 and *H. cinerea* 4; and the distance between the nostrils is 3.5 and 2.5. These figures would indicate the distance from the eye to the nostril was shorter in *H. evittata* than in *H. cinerea*, and that the distance between the nostrils was wider. However, if we include the same measurements of the seven specimens designated as the "paratypes" of *H. evittata*, we get a different ratio.

	Eye to nostril	Nostril to nostril
U.S.N.M. no. 66207	4.5	4.0
66208	4.0	3.0
66209	4.0	3.5
66210	4.0	3.5
29652	4.0	3.0
29653	4.0	3.5
29654	4.0	4.0

These figures indicate that the eye to nostril distance is 4.0 mm, which is the same as that for the *Hyla cinerea* compared with the type by Miller. The nostril-to-nostril measurement averages 3.5 mm. However, the nostril-to-nostril measurements on 20 specimens collected by Reed or Daffin in Maryland, Virginia, and Delaware average 3.5 mm also. So this variation is within the normal deviation of a population within the species.

"The granulation of the skin of belly and hind legs is identical in the two animals."

Noble and Hassler, as well as Dunn, concluded from their studies that *evittata* and *cinerea* could not be separated by the head width or slope to the snout. The former say that the series of *evittata* in the American Museum differ from the Cove Point specimens of *cinerea* in having a more vertical, less sloping profile to the snout. Con-

cerning the width of the head, which is said to be broader in *evittata*, they state that their series of *cinerea* exhibited a great variation in width and no constant difference could be found. Dunn agreed with this conclusion and added that the type and topotypes of *H. evittata* could not be separated from Carolina *cinerea* with any degree of certainty. Dunn also noted that in many species of Hylidae the male has a sloping snout and the female a blunt one: this may be the case in *cinerea* and *evittata*. So far as is known to the present author, no one has sexed the museum specimens of *evittata* and *cinerea* now available for study, nor has anyone determined whether the sexes are morphologically dimorphic.

Having discounted the characteristics of the head as distinguishing *evittata* from *cinerea*. Dunn rested the status of *evittata* upon the lateral stripes. From his study of 126 specimens from Virginia and Maryland he reported 81 percent of the upper tidewater Potomac populations with no stripes or short ones; 41 percent of the other Maryland and Virginia specimens with no stripes or short ones; 25 per cent of the North Carolina specimens with no stripes or short ones; and all the Gulf coast specimens with long stripes. This population study would indicate that northern colonies have a tendency to decrease the length of the lateral stripes to the point of obliteration. That this factor alone constitutes the basis of a new species or even a new subspecies is not substantiated by the study of the specimens at hand.

Miller stated that unstriped specimens from Bay St. Louis, Miss., and from New Orleans, La., had been seen by him. Thus, all (as stated by Dunn) of the Gulf coast populations do not have long stripes. Also, specimens with no stripes have been reported from North Carolina (stated above, 25 per cent) and from Maryland and Virginia other than from the type locality of *H. evittata*. Thus, throughout most of the range of *Hyla cinerea* specimens with no stripes or with partial stripes have been found, with a tendency for those populations northward to exhibit a greater percentage of the population to have shortened or obliterated stripes.

Contradictory to Schmidt's distribution, Dunn concluded from his study of *evittata* and *cinerea* that "*H. cinerea evittata* is unknown from Delaware and from the eastern side of the Delmarva Peninsula." Dunn's *evittata* had no stripes, and

on this basis his statement is likewise untenable in the light of collections by the author and Ralph Daffin. Daffin has collected *H. cinerea* with long and short stripes (in a proportion of 50-50) at Ocean Downs just west of Ocean City, which is very near the Atlantic Ocean on the eastern side of the Delmarva Peninsula, and the author has collected specimens with no stripes in Accomac County, Va., on the eastern side of the Delmarva Peninsula also. Selbyville, Sussex County, Del., is near the eastern coast.

Because of the occasional short stripe and long stripe in the same population, Conant (Publ. Soc., Nat. Hist. Delaware 1945: 4) concluded that the populations of *Hyla cinerea* inhabiting the Delmarva Peninsula were intermediate between the two subspecies. Some herpetologists have gone so far as to assume that there are two subspecies or species in our region and to call these populations hybrids, designating them as *Hyla cinerea cinerea* × *evittata*. Such conclusions have been based upon phenotypic characteristics and to the best of my knowledge have not been substantiated by experimentation nor even observation.

Beside the specimens in the United States National Museum which were carefully studied, including the type and topotypes of *Hyla evittata*, the author has collected and studied specimens from several new localities in Maryland, Delaware, and Virginia. The type locality for *H. evittata*, Four Mile Run, in Fairfax County, Va., was visited by the author on July 17, 1956. None of the frogs were heard calling at that time.

The material collected or studied by the author from Worcester and Wicomico Counties, Md., and from Accomac County, Va., indicates that all three striped types may be found in pure or mixed populations on the Delmarva Peninsula. The specimens from the Accomac County locality have no stripes; those from Ocean Downs have about 50-50 short and long stripes; and those from the Nanticoke River at Vienna (Wicomico-Dorchester County) have long stripes.

Representative specimens from localities in Maryland, Delaware, and the vicinity of the District of Columbia, including the type locality of *H. evittata* in Virginia, have been studied and are listed below. The most northern locality on the Delmarva Peninsula for *Hyla cinerea* is the Chesapeake and Delaware Canal which connects the Delaware River with the Elk River, which in



turn leads to the Chesapeake Bay. West of the Chesapeake Bay the most northern locality is in Baltimore County along the Chesapeake Bay along two estuaries of the Gunpowder River, Dundee Creek and Bird River, just north and east of Chase (Daffin 506-507 and Reed 1191).

**MARYLAND:** *St. Marys County:* Hay's Beach near Ridge (Cooper, l.c., 1953); *Charles County:* Nanjemoy Swamp near Riverside, July 1935, Reed. *Calvert County:* Abundant between Cove Point and Solomons Island (Noble and Hassler, l.c., 1936, 32 specimens typical *cinerea*, Amer. Mus.); Cove Point (Putens, Bull. Nat. Hist. Maryland 6(9): 57. 1936). *Anne Arundel County:* Ritchie Highway between Magothy and Severn Rivers, July 1956, Robert Simmons. *Baltimore County:* Dundee Creek and Bird River, near Chase along Grace's Quarters Road, June 25-26, 1956, Ralph Daffin 506-507, Reed 1191, Donald Lindsey 1-4. *Cecil County:* West end of Chesapeake-Delaware Canal, M. Joseph Cadbury (see Dunn, Proc. Biol. Soc. Washington 50: 10. 1937). *Cecil-Kent County:* Georgetown, on Sassafras River, July 20, 1915, Paul Lorrilliere (as *H. evittata*) (see Fowler, Copeia 1915, no. 22: 38) (note: Georgetown is in Kent County, which lies to the south of the Sassafras River, but the record states the specimen is from Cecil County). *Queen Annes County:* Near Centerville, June 23, 1938, R. H. McCauley (U.S.N.M. nos. 104446-50), and July 15, 1938, R. H. McCauley (U.S.N.M. nos. 104457). *Talbot County:* Easton, H. L. Clark, September 8, 1903 (U.S.N.M. no. 32106). *Dorchester County:* Cambridge, June 1928 (U.S.N.M. nos. 75287-8); Lloyds, W. P. Hay, June 1906 (U.S.N.M. nos. 36673-82), July 9, 1906 (U.S.N.M. nos. 100840-6), July 1907 (U.S.N.M. nos. 37833-7); Cambridge, September 1933, R. W. Jackson (U.S.N.M. no. 92598); Blackwater Refuge, 10 miles south of Cambridge. July 25, 1938, R. H. McCauley (U.S.N.M. nos. 104463-77). *Dorchester-Wicomico County:* Along Nanticoke River on both sides of the river, several large colonies, July 9, 1956, Reed 1150-51. *Worcester County:* Cedar Hall, June 27, 1938, R. H. McCauley (U.S.N.M. nos. 104451-6); pond 5 miles west of Ocean City at Ocean Downs, June 15, 1956, Ralph Daffin 458 and 545-554; swamp south of Pocomoke City, July 9, 1956, Reed; meadow, Girdletree, July 10, 1956, Reed.

**VIRGINIA—EASTERN SHORE:** *Accomac County:* 2 miles south of Oak Hall, July 9, 1956, Reed 1107. *Accomac-Northampton County:* Exmore, June 1938, M. K. Brady (USNM nos. 75277-86).

**VIRGINIA—along POTOMAC RIVER:** *Fairfax County:* Four Mile Run (TYPE LOCALITY for *Hyla evittata*), July 15, 1899 (not 1898, as stated by Wright and Wright in *Handbook of frogs and toads*, p. 310. Also there is no Alexandria County in Virginia), Gerrit S. Miller, Jr., and Edward A. Preble (U.S.N.M. no. 26291); paratypes, same locality, July 15, 1898 (U.S.N.M. nos. 66207-10), E. A. Preble, July 1898 (U.S.N.M. no. 45967);

G. S. Miller, July 4, 1901 (U.S.N.M. nos. 29652-54); P. Bartsch, 1935 (U.S.N.M. no. 101170); Dyke, below Alexandria, September 17, 1898, G. S. Miller. (U.S.N.M. no. 66211); Alexandria, July 3, 1912, J. Hunter (U.S.N.M. nos. 58085-6); New Alexandria, E. T. Wherry, September 1923 (U.S.N.M. no. 66327); Dogue Creek, near Fort Belvoir, June 4, 1939, H. J. Cole (U.S.N.M. nos. 127467-85); Little Hunting Creek, May 28, 1911, W. D. Appel (U.S.N.M. nos. 55443-4); 1923, M. K. Brady (U.S.N.M. nos. 66474-75); Mount Vernon, W. P. Hay, October 15, 1892 (U.S.N.M. nos. 39911-12); June 1893 (U.S.N.M. nos. 20891-33); E. A. Preble, October 28, 1900 (U.S.N.M. nos. 27742). *Prince William County:* Quantico, October 13, 1901, G. S. Miller (U.S.N.M. nos. 29620-21).

**DISTRICT OF COLUMBIA:** Washington, July 1, 1933, I. E. Gray (U.S.N.M. no. 91745, as *cinerea*); Oxon Run Marsh, August 1935, Perrygo & East (U.S.N.M. nos. 101159-69, as *evittata*); Oxon Run, July 13, 1936, C. S. East (U.S.N.M. nos. 107690-9, as *evittata*); August 1935 (U.S.N.M. nos. 101434; 101159-69) (Oxon Run borders Prince Georges County to the south side of the District of Columbia).

**DELAWARE:** *Sussex County:* Meadow near Selbyville, July 10-11, 1956, Reed.

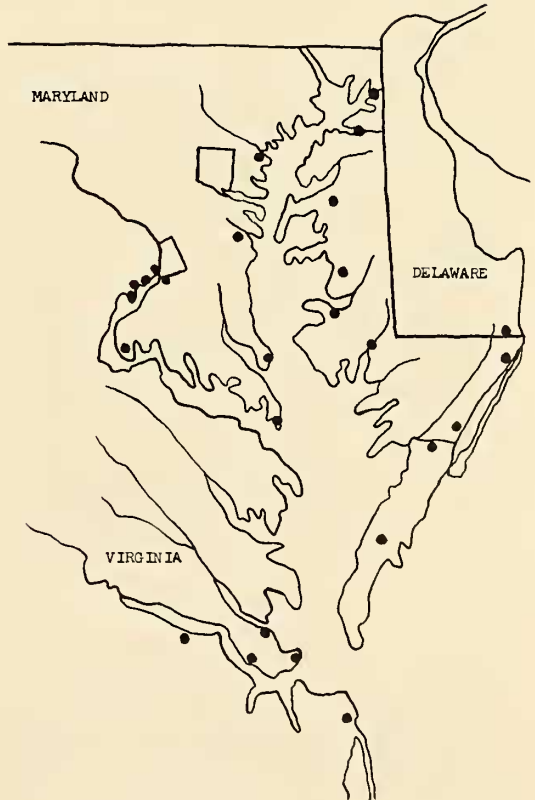


FIG. 1.—Distribution of *Hyla cinerea* (Schneider) in Maryland, Delaware, and Virginia.

For the Delmarva Peninsula, Roger Conant (Publ. Soc. Nat. Hist. Delaware 1945: 4) listed Cecil, Dorchester, Kent (Md.), Northampton, Sussex, Talbot, and Worcester Counties, without giving any specific records.

*Hyla cinerea* (Schneider), Garman, Bull. Illinois State Lab. Nat. Hist. **3**: 189. 1891, based on *Calamita cinereus* Schneider, *Hist. Amph.* **1**: 174. 1799. Syn.: *Hyla cinerea cinerea* Stejneger and Barbour, Checklist, ed. 2: 30. 1923; *Hyla bilineata* Shaw, Gen. Zool. **3**: 136. 1802; *Hyla lateralis* Daudin, in Sonnini and Latreille, Hist. Nat. Rept. **2**: 180. 1802; *Hyla semifasciata* Hallowell, Proc. Acad. Nat. Sci. Philadelphia **8**: 307. 1856; *Hyla evittata* Miller, Proc. Biol. Soc. Washington **13**: 76. 1899; *Hyla cinerea evittata* Stejneger & Barbour, Checklist, ed. 2: 30. 1923.

Range: Delaware (Sussex County) and Maryland (Baltimore County & Cecil County) southward along the Potomac River and south to Florida, westward in the Gulf States to Texas; and north in the Mississippi Basin to southern Illinois.

Concerning the range of *Hyla cinerea* in Virginia, there seems to be a gap on the peninsula between the Potomac River and the Rappahannock River (Northern Neck) and the peninsula between the Rappahannock River and the York River. However, at the mouth of the York River, southward around on the James River and up to Surry County, Va., *Hyla cinerea* and specimens designated as *H. cinerea* × *evittata* have been collected. Also, across the mouth of the Chesapeake Bay in Princess Anne County, *Hyla cinerea* and the putative hybrids have been collected.

The author has collected four years on Northern Neck and has been unable to find *Hyla cinerea*. Several plants and animals are found on the southern side of the Potomac River but

not on the northern side; as *Eumeces inexpectatus*, and the plants *Galax aphylla*, *Asarum virginicum*, and *Oxydendrum arboreum*. Several plants are known which range from the York-James Peninsula and Princess Anne County region to the eastern shore of Virginia, most notable being *Trillium pusillum* var. *virginianum*, *Xanthoxylum clava-herculis*, and *Baptisia alba*. *Hyla cinerea* also seems to follow this pattern of distribution, with the exception that it has migrated further northward and westward. Cypress went up the inner side of the Delmarva Peninsula into Pungoteague and up the Pocomoke River, as well as up the western shore of the Chesapeake Bay, especially up the Patuxent River. Specimens of *Hyla cinerea* from the two remaining peninsulas of Virginia are highly desirable to complete our picture for the distribution of *Hyla cinerea* in the Maryland-Virginia-Delaware region.

The specimens studied from the lower Chesapeake Bay region of Virginia are listed below.

VIRGINIA: *York County*: Yorktown, June 22, 1948, R. L. Hoffman (U.S.N.M. nos. 131634-6), near mouth of York River. *Elizabeth City County*: Hampton, May 1903, G. S. Miller (U.S.N.M. nos. 31662-5); same, but grouped as *H. cinerea* × *evittata*, May 1903, G. S. Miller (U.S.N.M. nos. 31659-61). *Warwick County*: Menchville, August 2, 1949, R. L. Hoffman (U.S.N.M. nos. 131940-2). *Surry County*: A. H. Jennings, May 1917 (U.S.N.M. no. 59879), as *H. cinerea* × *evittata*. *Princess Anne County*: Virginia Beach, July 13, 1928, H. E. Ewing & C. S. East (U.S.N.M. nos. 75377-81); Sand Bridge, August 6, 1946, Hoffman & Kleinpeter (U.S.N.M. no. 133696); between Pungo and Sigma, August 1, 1946, Hoffman & Kleinpeter (U.S.N.M. no. 124860), as *H. cinerea* × *evittata*.

In conclusion, it is fairly well established that there exists no definite set of factors which would distinguish two distinct species or subspecies of *Hyla cinerea*. Therefore, taxonomically all specimens heretofore designated as *Hyla cinerea evittata* or *Hyla evittata* should be designated as *Hyla cinerea*.

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*The substitution of analogy for fact is the bane of chemical philosophy; the legitimate use of analogy is to connect facts together and to guide to new experiments.*—H. DAVY